Owner's Manual

APS PowerVerter®

Alternative Power Sources (230V, 50 Hz)
• Voltage- and Frequency-Controlled • Peak Power • High Efficiency

Introduction 2

Important Safety Instructions 4

Configuration & Connection 5

Features 11

Maintenance and Service 14

Limited Warranty 14

Troubleshooting 15

Specifications 16

Español 18

TRIPP·LITE
THE POWER PEOPLE

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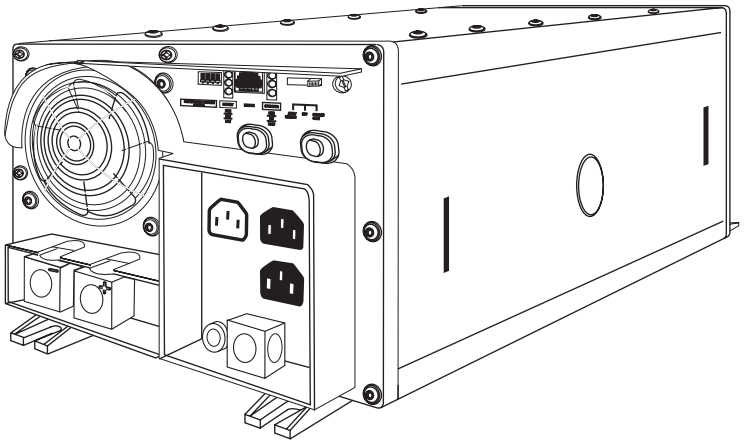
Introduction



Congratulations! You've purchased the most advanced, feature-rich integrated inverter and battery charger on the market. Your APS provides your equipment with utility-supplied AC power when it is available, and during blackouts, overvoltages and brownouts, your APS automatically switches over to an external battery source to power connected equipment with voltage and frequency-controlled AC power. In addition to reliable APS performance, your model features:

High Efficiency Output

Your APS's advanced circuitry produces a more efficient DC-to-AC conversion, minimizing energy loss. This allows you to run connected equipment longer between battery charges. The APS will maintain this highly-efficient output even as the battery charge decreases.

Automatic Overload Protection

If you overload your APS, it will automatically protect itself and your valuable batteries from damage.

Fast Load Switching

Your APS provides an uninterruptable power supply. If AC power goes down, your APS will switch over to providing battery backup power in 6 milliseconds or less so that your equipment will operate with no interruption.

Multi-Function Indicator Lights

Several sets of multifunction indicator lights keep you constantly informed of battery charge levels, fault conditions and APS operation.

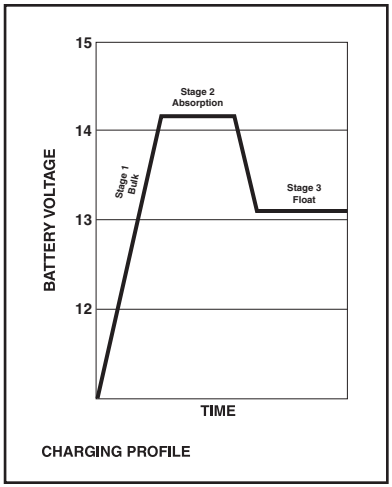
Multi-Operation Switches

An array of user-configurable switches gives you convenient options when operating your APS. You can select the voltage level at which your APS's inverter will turn on to maximize equipment protection and minimize battery drain; set your APS for maximum charging efficiency with your battery type; even set up your APS for remote control operation.

3-Stage Battery Charger

Your APS recharges your battery faster than conventional chargers because its three-stage charger profile (Bulk, Absorption and Float) are optimized, regardless of the type of battery you use (Wet or Gel).* In addition, the advanced charging system protects against over-charge and over-discharge to ensure a longer service life from your battery.

* *The Absorption and Float levels vary according to battery type, which can be set to either "Wet" or "Gel" cell.*



CHARGING PROFILE

Voltage Regulation (Select models only)

"VR" APS models regulate incoming AC power by automatically "boosting" or "cutting" the voltage to keep your equipment running through brownouts and overvoltages without draining battery power.

Load Sharing (Select models only)

Select APS models can be set to limit their own charging functions so they can charge their batteries at the quickest rate possible without overloading their power input circuits.

Frequency-Controlled Inverter Output

All APS models feature Frequency-Controlled Inverter Output which allows devices dependent on AC line frequency (such as computers, VCRs, CD players, tape recorders, clocks and turntables) to operate properly.

Circuit Board Protection

A silicone conformal coating safeguards the circuit boards against moisture.

Important Safety Instructions

SAVE THESE INSTRUCTIONS

This manual contains important instructions and warnings that should be followed during the installation, operation and storage of all Tripp Lite APS Systems.

APS Location Warnings

- Install your APS indoors, away from excess moisture or heat, dust or direct sunlight.
- Your APS is NOT waterproof. Contact with water can cause the unit to short circuit and could cause personal injury due to electric shock. Never immerse your APS. Mount it in the driest location available.
- Leave adequate space around all sides of the APS for proper ventilation. The heavier the load of connected equipment, the more heat will be generated by the APS.
- Do not install the APS near magnetic storage media, as this may result in data corruption.

Battery Connection Warnings

- Your APS will not operate with or without utility power until batteries are connected.
- Multiple battery systems must be made up of batteries of the same voltage, age, amp hour capacity and type.
- Keep battery location well ventilated. Explosive hydrogen gas can accumulate near batteries if they are not kept well ventilated.
- Sparks may result during final battery connection. Always observe proper polarity as batteries are connected.
- Do not allow objects to contact the two DC input terminals. Do not short or bridge these terminals together. Serious injury to property or person could result.

Equipment Connection Warnings

- Do not use Tripp Lite APS Systems in life support applications where a malfunction or failure of a Tripp Lite APS System could cause failure or significantly alter the performance of a life support device.
- Do not connect a surge suppressor, line conditioner or UPS to the output of the APS.
- Corded models: Do not modify the APS's plug in a way that eliminates its ground connection. Do not use power adaptors that will eliminate the plug's ground connection. Connect your APS only to a properly grounded AC power outlet. Do not plug your APS into itself; this will damage the APS and void your warranty.

Operation Warnings

- Your APS does not require routine maintenance. Do not open your APS for any reason. There are no user-serviceable parts inside.
- Potentially lethal voltages exist within this unit as long as the battery supply and/or AC input are connected. During any service work, the battery supply and AC input connection (if any) should therefore be disconnected.
- Do not connect or disconnect batteries while the APS is operating from the battery supply. Dangerous arcing may result.

Configuration

Configuration Dip Switch Settings

DIP SWITCH GROUP A (All models)

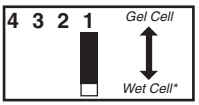
BATTERY TYPE / VOLTAGE POINT

Using a small tool, set the 4 "Battery Type / Voltage Point" Configuration DIP Switches, Group A (located on the front panel of your APS; see Diagram 1, p. 36) to select battery type and set the voltage range outside of which your APS will switch to battery power.

• Select Battery Type *(DIP Switch #1, Group A)*

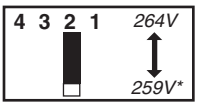
CAUTION: The Battery Type DIP Switch setting must match the type of batteries you connect or your batteries may be degraded or damaged over an extended period of time. See "Battery Selection," page 8 for more information.

Battery Type	Switch Position
Gel Cell (Sealed) Battery	Up
Wet Cell (Vented) Battery	Down*



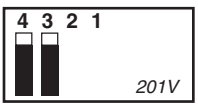
• Select High AC Voltage Switch To Battery Point *(DIP Switch #2, Group A)*

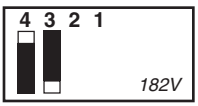
Voltage	Switch Position
264V	Up
259V	Down*

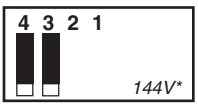


• Select Low AC Voltage Switch To Battery Point *(DIP Switches #4, Group A & #3, Group A)*

Voltage	Switch Postion
201V	#4 Up & #3 Up
182V	#4 Up & #3 Down
163V	#4 Down & #3 Up
144V	#4 Down & #3 Down*







Most loads will perform adequately when your APS's High AC Voltage Point DIP Switch #2 is set to 259V and its Low AC Voltage Point DIP Switches #3 and #4 are set to 182V. However, if your APS frequently switches to battery power due to momentary high/low line voltage swings that would have little effect on equipment operation, you may wish to adjust these settings. By raising the High AC Voltage Switch to Battery point and/or lowering the Low AC Voltage Switch to Battery Point, you may reduce the number of times your APS switches to battery due to voltage swings.

** Factory default settings*

DIP SWITCH GROUP B **(Available on Select Models)**

LOAD SHARING/EQUALIZE BATTERY CHARGE

Using a small tool, set the "Load Sharing" Configuration DIP Switches, #1 and #2 of Group B (located on the front panel of your APS; see Diagram 1, p. 36). DIP Switch #3, Group B should be kept in the "UP" position when you are not equalizing your batteries' charges. DIP Switch #4, Group B has no function.

• Load Sharing *(DIP Switches #1, Group B & #2, Group B)*

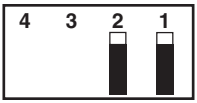
Your APS features a high-output battery charger that can draw a significant amount of power from your line power source when charging at its maximum rate. If an APS is supplying its full AC power rating to its connected load at the same time as it is charging, it could trip its line source circuit breaker. Tripping this breaker will cut off AC power to your load and stop battery charging.

To reduce the chance of tripping this breaker, select APS models may be set to automatically limit their charger output to keep the sum of their AC load and charger power within their circuit breakers' rating.

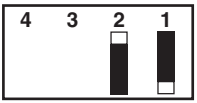
This charger limiting function has four settings, allowing you to choose less charger limiting for APS configurations with higher rated breakers. The figures below show how to set your DIP Switches to select how heavy a load can be placed on your APS before charger limiting begins.

Battery Charger Limiting Points

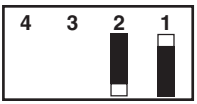
MOST LIMITING (#1 & #2 Up*): Charger limiting takes effect the moment any load is applied; charger output falls gradually from full output at no load to no output at full load.



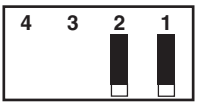
LESS LIMITING (#1 Down & #2 Up): Charger limiting begins when the APS's load reaches 33% of the APS's load rating. Charger output falls gradually from full output at 33% of the APS's load rating to about 40% of full output at full load



LEAST LIMITING (#1 Up & #2 Down): Charger limiting begins at when the APS's load reaches 66% of the APS's load rating. Charger output falls gradually from full output at 66% of the APS's load rating to about 40% of full output at full load.



NO LIMITING (#1 & #2 Down): No charger limiting occurs at any load size.



** Factory default setting.*

• Equalize Battery Charge *(DIP Switch #3, Group B)*

This DIP Switch is momentarily engaged to begin the process of equalizing the internal resistance of your battery's cells. This can extend the useful life of certain types of batteries; consult with your battery's manufacturer to determine if your batteries could benefit from this process. The charge equalization process is automatic and once started can only be stopped by removing the input power.

Setting Procedure

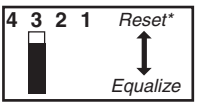
- Move to "Equalize" (DOWN) position for three seconds.
- Move to "Reset" (UP) position and leave it there.

CAUTION: Battery charge equalization should only be performed in strict accordance with the battery manufacturer's instructions and specifications.

CAUTION: Do not leave DIP switch #3 in the down position after beginning process.

Battery Charge	Switch Position
Reset	Up*
Equalize	Down

** Factory default setting.*

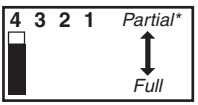


• Limit Battery Charger *(DIP Switch #4, Group B) (APSINT1524 only)*

To prevent overheating smaller batteries, the charger on this UPS system is initially set to deliver only a fraction of its maximum power rating to connected batteries. If you are using this system with a larger (over 100 amp-hours) battery or battery system, you may switch your battery charger to full power without overheating your batteries.

Battery Charger	Switch Position
Partial (1/3) Charging Power	Up*
Full Charging Power	Down

** Factory default setting.*



Battery Selection

Selecting Battery Type

Select a battery or system of batteries that will provide your APS with proper DC voltage and an adequate amp hour capacity.* Select 'Deep-Cycle' batteries to enjoy optimum performance from your APS. Batteries of either Wet-Cell (vented) or Gel-Cell/Absorbed Glass Mat (sealed) construction are ideal. 6 Volt "golf-cart", Marine Deep-Cycle or 8D Deep-Cycle batteries are also acceptable.**

** Even though APS models are high-efficiency converters of electricity, their rated output capacities are limited by the amp-hour size of the external batteries. ** You must set Configuration DIP Switch #1, Group A (Battery Type) to match the type of batteries you connect or your batteries may be degraded or damaged over an extended period of time. See "APS Configuration," page 5 for more information.)*

Selecting Battery Amp Hour Capacity

1. Add the Wattage Ratings of your connected equipment to determine the Total Wattage Required.*
2. Divide the Total Wattage Required (from Step 1) by the battery voltage to determine the DC Amperes Required.
3. Multiply the DC Amperes Required (from Step 2) by the number of hours you estimate will pass without AC power before your battery can recharge to determine a Battery Amp-Hours Required Rough Estimate.**
4. Compensate for inefficiency by multiplying your Battery Amp-Hour Required Rough Estimate (from Step 3) by 1.2 to determine how many amp-hours of battery backup (from one or several batteries) you should connect to your APS. Note that the Amp-Hour ratings of batteries are usually given for a 20 hour discharge rate. Actual Amp-Hour capacities are less when batteries are discharged at faster rates: batteries discharged in 55 minutes provide only about 50% of their listed Amp-Hour ratings, while batteries discharged in 9 minutes provide as little as 30% of their Amp-Hour ratings.

** The wattage rating is usually stated in the equipment's manuals or on their nameplates. If your equipment is rated in amperes, convert to watts by multiplying the ampere rating by your nominal AC line voltage (230). ** Your charging amps multiplied by the charging hours must exceed the discharge amp-hours taken from the batteries between charges or you will eventually run down your battery bank.*

Mounting *(Optional)* *(See Diagram 2, p. 36)*

Horizontal mounting should be used for all vehicular applications. Due to their size and weight, all APS PowerVerter systems in vehicles should be mounted on a rigid horizontal (not vertical) surface, mounting plate or bracket before battery connection.User must supply all fasteners and brackets and verify their suitability for use with the intended mounting surface. Turn your APS PowerVerter and connected equipment OFF before mounting.

- Install two 8 mm (1/4 in.) fasteners (A) into a rigid horizontal surface using the measurements in the diagram. Leave the heads of fasteners raised slightly above the surface in order to engage the slots in the APS's feet.
- Slide PowerVerter forward to fully engage the fasteners in the APS's feet. Install two 8 mm (1/4 in.) fasteners (B) into the surface, through the slots in the APS's two unsecured feet. Tighten the screws to secure the APS in position.

Battery Connection

Standard

1. Connect your APS's positive DC Terminal directly to a fuse.

   Tripp Lite recommends that you install a recognized component fuse block and fuse within 18 inches of the battery. The fuse's rating must equal or exceed the Minimum DC Fuse Rating listed in your APS model's specifications on pages 16 or 17.

2. Choose a battery configuration appropriate to your batteries.
   - Single Battery Connection: Refer to Diagram 4, page 37. When using a single battery, its voltage must be equal to the voltage of your APS's Inverter Nominal Input Voltage (see specs).
   - Parallel Battery Connection: Refer to Diagram 5, page 37. When using multiple batteries in parallel, each battery's voltage must be equal to the voltage of your APS's Inverter Nominal Input Voltage (see specs).
   - Series Battery Connection: Refer to Diagram 6, page 37. When using multiple batteries in series, all batteries must be equal in voltage and amp hour capacity, and the sum of their voltages must be equal to the voltage of your APS's Inverter Nominal Input Voltage (see specs).

3. Use 2/0 gauge wire ONLY to make external battery connections. Tighten battery terminals to a torque of 4 N-m.

Battery connection cable lengths should be short as possible, and must not exceed the Maximum Cable Length listed under Specifications, page 16 or 17. Shorter and heavier gauge cabling limits DC voltage drop and allows for maximum transfer of current.* You must tighten your battery terminals to approximately 4 Newton-meters of torque to create an efficient connection and prevent excessive heating. Insufficiently tightening terminals could void your PowerVerter's warranty.

** APS models are capable of delivering a much higher wattage output for brief periods of time. Wiring should be configured to handle this brief high-current draw. Though your APS is a high-efficiency converter of electricity, its rated output capacity is limited by the length and gauge of the wires running from the battery to the APS.*

DC Vehicular

APS systems may be permanently mounted in a car, truck or boat and connected to draw power from the vehicle's battery. **Note: An APS can ONLY be connected to vehicle batteries with voltage that matches the APS's Nominal DC Input—12V vehicle batteries to 12V Nominal DC Input APS systems, etc. (See Specifications).** There are two main ways to make this sort of vehicular battery connection. Choose the Basic Connection if you are running light hand tools or other small appliances for a brief period of time **(see Diagram 7, p. 38)**. Choose the Advanced Connection if you are using your APS to power heavy loads for extended periods of time **(see Diagram 8, p. 38).** The Advanced Connection incorporates a battery isolator and separate battery system to provide battery power to your APS while preventing it from draining your vehicle's battery. Note: Depending on your application, you may require more than one Deep Cycle Battery.

Caution: Never operate your APS from an alternator without a battery connected as shown in Diagrams 7 or 8, p. 38.

Battery Connection *continued*

DC Ground Connection

APS systems must be connected to a grounded, permanent wiring system. For most installations, the negative battery conductor must be bonded to the grounding system at one (and only one) point in the system. All installations must comply with national and local codes and ordinances.

AC Connection

Before AC connection, match the power requirements of your equipment with the power output of your APS to avoid overload.

When figuring the power requirements of your equipment, do not confuse "continuous" power ratings with "peak" power ratings. Electric motors require more power to turn on ("peak power") than they require to run continuously. "Peak" power ratings are usually 2 to 5 times "Continuous" ratings. Most electric motors require "peak power" only when they are first turned on. The electric motors in equipment such as refrigerators and sump pumps, however, constantly turn on and off according to demand. These motors require "peak power" at multiple, unpredictable times during their operation.

Hardwired Electrical Connections (All hardwire models) *(See Diagram 3, p. 36)*

Consult a qualified electrician and follow all applicable electrical codes and requirements.

HARDWIRE PROCEDURE

1. Remove screws and cover plate from your APS's Hardwire AC electrical box. Remove the knockout covers closest to the desired electrical source and to your equipment.
2. Thread your wires through strain reliefs and through the knockouts.
3. Connect all input and output ground wires to the input/output ground tie point.
4. Connect the incoming hot wire to the input hot (brown) terminal.
5. Connect the incoming neutral wire to the input neutral (blue) terminal.
6. Connect the outgoing hot wire to the output hot (black) terminal.
7. Connect the outgoing neutral wire to the output neutral (white) terminal.
8. Tighten and affix strain reliefs. Replace cover plate and tighten screws.

AC Input Electrical Connection (All corded models)

This IEC receptacle should be connected to a dedicated 15 Amp AC utility outlet that provides a connection to ground. A detachable IEC cord is provided for this purpose. Plug it into an outlet providing 230V AC power at 50 Hz. A user-supplied adapter that maintains the UPS's connection to ground may be necessary. (A technician may be able to convert your APS to receive 60 Hz. power. Consult Tripp Lite for details.) Make sure that the circuit you connect your APS to has adequate overload protection, such as a circuit breaker or a fuse.

AC Connection *continued*

AC Output Electrical Connection (All corded models)

Simply plug your equipment into the unit's AC receptacles. If adapters must be used, choose adapters that provide a connection to ground.

Set Operating Mode Switch

- Switch to "AUTO/REMOTE" when you are using connected equipment. ADVANTAGE: Uninterruptible power supply. Provides battery backup power during blackouts or brownouts.

  Note: When the switch is in the "AUTO/REMOTE" position, you can operate a user-supplied switch to transfer between battery-backup and charge-only modes. (See Remote Connector manual for more information.)

- Switch to "CHARGE ONLY" when you are not using connected equipment. (WARNING! APS will not provide battery backup!) ADVANTAGES: A) Continues to charge battery when power is present, and B) Turns OFF the APS's inverter, preventing battery drain during blackouts or brownouts.
- Switch to "OFF" to completely turn off the APS and connected equipment or to reset the APS after it has shut down due to overload or overheating.

Switches, Indicator Lights & Other Features

(See Diagrams 9a and 9b, p. 39 and 40 to locate the following switches, indicator lights and other features.)

Switches

1. **Operating Mode Switch (All models):** This switch selects the APS operating mode (either "AUTO/REMOTE", "OFF" or "CHARGE ONLY"). See "Set Operating Mode Switch", pg. 11 to select the optimum setting for this switch.
2. **"CONFIGURATION SWITCHES"—DIP Switch Group A (All models):** These four switches must be set for the type of battery your APS will be connected to and the voltage points at which your APS will switch to battery power. See "Configuration", pg. 5 to select the optimum settings for these switches.
3. **"CONFIGURATION SWITCHES"—DIP Switch Group B (Select models only):** These DIP Switches allow you to equalize the internal resistance of your battery's cells and set the percentage of your model's maximum load at which the APS will limit battery charging. See "Configuration", pg. 6 to select the optimum settings for these switches.

Indicator Lights

4. **"LINE" (All models):** This green light will turn continuously ON whenever connected equipment is receiving utility-supplied AC power and your APS is set to "AUTO/REMOTE", meaning that it will provide battery backup if utility power fails. It will flash intermittently when connected equipment is receiving utility power and your APS's Operating Mode Switch is set to "CHARGE ONLY" to warn you that the APS's inverter is OFF and that the APS WILL NOT provide battery backup during blackouts, brownouts or overvoltages.
5. **"INV" (Inverting—all models):** This yellow light will turn continuously ON whenever connected equipment is receiving battery-supplied AC power (during a blackout, brownout or overvoltage while connected to utility power or when connected to batteries during vehicular operation).
6. **"LOAD" (All models):** This red light will turn continuously ON when the APS's load is between 80% and 110% of capacity. The light will flash intermittently when the APS's inverter shuts down due to a severe overload or overheating. If this happens, turn Operating Mode Switch OFF. Remove the overload and let the unit cool. You may then turn the APS ON after it cools.
7. **"CUT/BOOST" (VRI models only):** These lights will turn ON whenever your APS is automatically correcting high (CUT) or low (BOOST) AC line voltage. This is a normal, automatic operation of your APS that does not drain battery power, and no action is required on your part.
8. **"BATTERY HI/MED/LO" (All models):** These three lights will turn ON in several sequences to show the approximate charge level and voltage of your connected battery bank and alert you to several fault conditions:

BATTERY CHARGE INDICATION (Approximate)

Indicator	Capacity
Green	91% - Full
Green & yellow	81% - 90%
Yellow	61% - 80%
Yellow & red	41% - 60%
Red	21% - 40%
All three lights off	1% - 20%
Flashing red	0% (Inverter shutdown)
All three lights flash slowly*	Excessive discharge
All three lights flash quickly**	Overcharge

** Approximately 1/2 second on, 1/2 second off. See Troubleshooting section. ** Approximately 1/4 second on, 1/4 second off. May also indicate a battery charger fault exists. See Troubleshooting section.*

Other Features

9. **DC Input Terminals (All models):** The terminals' lug screws secure the wires leading from your external battery or battery system. Your battery or battery system must provide your APS with proper DC voltage and your equipment with an adequate amp hour capacity. See Battery Selection section, pg. 8 for more information.

10. **AC Receptacles: IEC 320 (Corded models only):** These IEC receptacles allow you to connect equipment that would normally be plugged into a utility outlet. For other plug configurations, use an adapter that provides a connection to ground.

11. **AC Input: IEC 320 (Corded models only):** This IEC receptacle should be connected to a dedicated 15 Amp AC utility outlet via an adapter cord that provides a connection to ground. A detachable IEC to 5-15 cord is provided for this purpose. DO NOT plug the cord into the APS's AC receptacles.

12. **Hardwire AC Input/Output Terminal Strip (Hardwire models only):** Use the lug screws on these terminals to secure hardwire connections for AC input and output. See pages 10 & 36 for wiring instructions.

13. **Resettable Circuit Breakers (All models):** These circuit breakers protect your APS against damage due to input or output overload. If a breaker trips, remove some of the load on the APS to prevent overload, then wait 1 minute to allow components to cool before resetting the circuit breaker.

14. **Remote Module Connector (All models):** The front panel of all models has an RJ45 receptacle for use with the optional remote module. (Module is included with all VR models.) See the installation instructions packed with the remote module.

15. **Load Sense Potentiometer (All models):** In order to save battery power, the APS's inverter automatically shuts off when no load is connected. When the unit detects a load, it automatically turns the inverter on. Users may choose the minimum load the APS will detect by adjusting the Load Sense Potentiometer. Using a small tool, turn the potentiometer clockwise to lower the minimum load that will be detected, causing the inverter to turn on for smaller loads. When the potentiometer is turned fully clockwise, the inverter will operate even when there is no load. Turn the potentiometer counterclockwise to increase the minimum load that will be detected, causing the inverter to stay off until the new minimum load is reached. The factory setting for the potentiometer is fully clockwise, but in areas with frequent power interruptions, the potentiometer should be adjusted counterclockwise until the inverter is only in operation when the APS's load is in use.

Maintenance & Service

Maintenance

Your APS model requires no maintenance but should be kept dry at all times. Periodically check all cable connections both at the unit and at the battery. Clean and tighten connections as necessary.

Service

If returning your APS to Tripp Lite, please pack the APS carefully, using the ORIGINAL PACKING MATERIAL that came with the unit. Enclose a letter describing the symptoms of the problem. If the APS is within the warranty period, enclose a copy of your sales receipt.

Limited Warranty

Tripp Lite warrants its products to be free from defects in materials and workmanship for a period of one year (domestic) or 120 days (export) from the date of initial purchase. Tripp Lite's obligation under this warranty is limited to repairing or replacing (at its sole option) any such defective products. To obtain service under this warranty you must obtain a Returned Material Authorization (RMA) number from Tripp Lite or an authorized Tripp Lite service center. Products must be returned to Tripp Lite or an authorized Tripp Lite service center with transportation charges prepaid and must be accompanied by a brief description of the problem encountered and proof of date and place of purchase. This warranty does not apply to equipment which has been damaged by accident, negligence or misapplication or has been altered or modified in any way. This warranty applies only to the original purchaser who must have properly registered the product within 10 days of purchase.

EXCEPT AS PROVIDED HEREIN, TRIPP LITE MAKES NO WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Some states do not permit limitation or exclusion of implied warranties; therefore, the aforesaid limitation(s) or exclusion(s) may not apply to the purchaser.

EXCEPT AS PROVIDED ABOVE, IN NO EVENT WILL TRIPP LITE BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF THIS PRODUCT, EVEN IF ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. Specifically, Tripp Lite is not liable for any costs, such as lost profits or revenue, loss of equipment, loss of use of equipment, loss of software, loss of data, costs of substitutes, claims by third parties, or otherwise.

Troubleshooting

Try these remedies for common APS problems before calling for help. Call Tripp Lite Customer Service at (773) 869-1234 before returning your APS for service.

SYMPTOM	PROBLEMS	CORRECTIONS
APS does not provide AC output (AC input present)	APS not properly connected to utility power.	Connect APS to utility power.
	Circuit breaker is tripped.	Reset circuit breaker.
	APS shutdown due to excessive battery voltage, indicating possible charger failure. Line disconnected to prevent permanent battery damage.	Turn APS “OFF”. Wait 1 minute and switch to “AUTO/REMOTE”.
	APS is set to “OFF”	Set APS to “AUTO/REMOTE” or “CHARGE-ONLY”.
APS does not provide AC output (AC input absent)	Circuit breaker is tripped.	Reset circuit breaker.
	Operating Mode Switch is set to “CHARGE ONLY”.	Set Operating Mode Switch to “AUTO/REMOTE.”
	Load or High Temperature fault.	Turn APS “OFF”. Wait 1 minute. Remove overload. Switch to “AUTO/REMOTE”.
	Excessive battery discharge.	Check battery condition.
APS will not charge the battery (AC input present)	Connected batteries are dead.	Check and replace old batteries.
	Battery fuse* is blown.	Check and replace fuse.
	Battery cabling* is loose or degraded.	Check and tighten or replace cabling.
	APS charger failure.	Turn APS “OFF”. Wait 1 minute and switch to “AUTO/REMOTE”. If automatic shutdown occurs, call Tripp Lite Customer Service.
All APS Indicator Lights are OFF (AC input absent)	This is normal if the APS is set to “CHARGE-ONLY”	—
All APS Indicator Lights are OFF (AC input is present or absent)	Excessive battery discharge.	Use an auxiliary charger* to raise battery voltage. Check external battery connections and fuse. Automatically resets when condition is cleared.
All APS Battery Indicator Lights are slowly flashing.	Excessive battery discharge.	Use an auxiliary charger* to raise battery voltage. Automatically resets when condition is cleared.
APS “LOAD” Battery Light flashing	Inverter shutdown because battery voltage dropped too low for more than 5 seconds. Protects battery from permanent damage.	Reset by cycling control switch to “OFF” position then to “AUTO/REMOTE”.
All APS Battery Lights are rapidly flashing	High battery voltage shutdown during Charge mode.	Check all charging sources. Reset by cycling control switch to “OFF” then to “AUTO/REMOTE” or “CHARGE-ONLY”.
APS “LOAD” Indicator Light is rapidly flashing	Inverter overload caused by excessive load or short circuit. If sustained for more then 5 seconds the Inverter is shutdown.	Reset by reducing load and cycling control switch to “OFF” position then to “AUTO/REMOTE”.

** User supplied*

Specifications *(Corded Models)*

CORDED MODELS:	**APSINT1012**
Weight:	11.9 Kg
INVERTER	
Continuous power (@ 20° C):	1000 W
Surge power (5 seconds):	2000 W
Efficiency (Full Load):	88%
Minimum DC Fuse Rating:	170A
DC Input Current @ Nominal V DC	
Full Load	95A
No Load	2.6A*
Nominal Input Volts:	12 VDC
DC Input Voltage Range:	10-15 VDC
Nominal Output Volts:	230 VAC ±5%
Nominal Output Frequency:	50† Hz ±.3%
BATTERY CHARGER	
Charging Capacity DC:	30 A
Maximum Cable Length	2 ft.
Acceptance Volts VDC:	Selectable 14.4 V**/14.2 V Wet**/Gel
Float Volts VDC (w/gel):	13.3 V (13.6 V)
Input Voltage AC:	230 V
Input Current AC:	3.3 A
LINE VAC OPERATION	
Minimum Input AC Volts:	Selectable 144**,163, 182 or 201VAC
Maximum Input AC Volts (Continuous, Charger at Maximum):	Selectable 259** or 264 VAC
Maximum Input Current (Continuous, Charger at Maximum):	12.0 A
Input Frequency:	50 Hz ±10%
Maximum Output AC (Continuous):	4.3 A
Automatic Transfer Time:	4-6 ms

** Load sense can reduce this to 1/30 of the listed current. **Factory default setting.*
† A technician may be able to convert your UPS to receive 60 Hz ±10%power. Consult Tripp Lite for details.

Specifications *(Hardwired Models)*

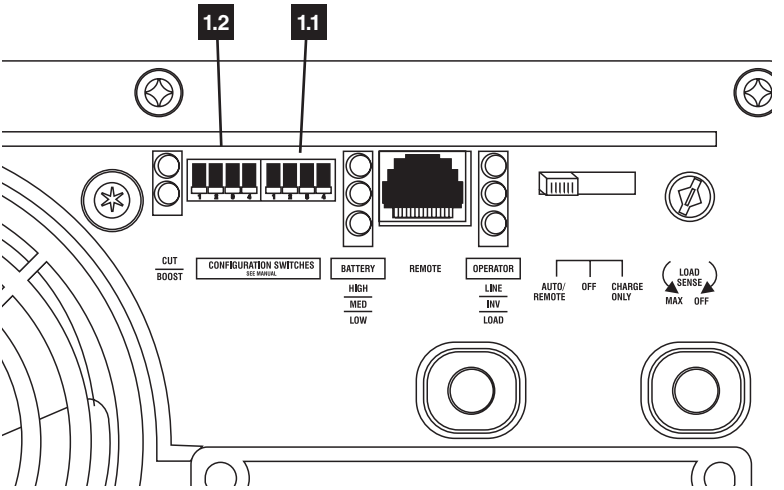
HARDWIRED MODELS:	**APSINT1524**	**APSINT2012**
Weight:	12.7 Kg	17.1 Kg
INVERTER		
Continuous power (@ 20° C):	1500 W	2000 W
Surge power (5 seconds):	3000 W	4000 W
Efficiency (Full Load):	89%	87%
Minimum DC Fuse Rating:	90A	370A
DC Input Current @ Nominal V DC		
Full Load	70A	192 A
No Load	1.5A*	3 A*
Nominal Input Volts:	24 VDC	12 VDC
DC Input Voltage Range:	20-30 VDC	10-15 VDC
Nominal Output Volts:	230 VAC ±5%	230 VAC ±5%
Nominal Output Frequency:	50† Hz ±.3%	50† Hz ±.3%
BATTERY CHARGER		
Charging Capacity DC:	10 A**	60 A
Maximum Cable Length	7 ft.	1 ft.
Acceptance Volts VDC:	Selectable 28.8 V**/28.4 V Wet**/Gel	Selectable 14.4 V**/14.2 V Wet**/Gel
Float Volts VDC (w/gel):	26.6 V (27.2 V)	13.3 V (13.6 V)
Input Voltage AC:	230 V	230 V
Input Current AC:	2.2 A**	7.0 A
LINE VAC OPERATION		
Minimum Input AC Volts:	Selectable 144**, 163, 182 or 201 VAC	Selectable 144**,163, 182 or 201 VAC
Maximum Input AC Volts (Continuous, Charger at Maximum):	Selectable 259** or 264 VAC	Selectable 259** or 264 VAC
Maximum Input Current (Continuous, Charger at Maximum):	13.0 A	16 A
Input Frequency:	50 Hz ±10%	50 Hz ±10%
Maximum Output AC (Continuous)	6.5 A	8.7 A
Automatic Transfer Time:	4-6 ms	4-6 ms

HARDWIRED MODELS (Cont.):	**APSINT2424**	**APSVRI3636**
Weight:	18.5 Kg	25.6 Kg
INVERTER		
Continuous power (@ 20° C):	2400 W	3600 W
Surge power (5 seconds):	4800 W	7200 W
Efficiency (Full Load):	89%	88%
Minimum DC Fuse Rating:	220A	130A
DC Input Current @ Nominal V DC		
Full Load	112 A	114 A
No Load	1.8 A*	2 A*
Nominal Input Volts:	24 VDC	36 VDC
DC Input Voltage Range:	20-30 VDC	30-45 VDC
Nominal Output Volts:	230 VAC ±5%	230 VAC ±5%
Nominal Output Frequency:	50† Hz ±.3%	50† Hz ±.3%
BATTERY CHARGER		
Charging Capacity DC:	30 A	30 A
Maximum Cable Length	3 ft.	4.5 ft.
Acceptance Volts VDC:	Selectable 28.8 V**/28.4 V Wet**/Gel	Selectable 43.2 V**/42.6 V Wet**/Gel
Float Volts VDC (w/gel):	26.6 V (27.2 V)	39.9 V (40.8 V)
Input Voltage AC:	230 V	230 V
Input Current AC:	7.0 A	10.4 A
LINE VAC OPERATION		
Minimum Input AC Volts:	Selectable 144**,163, 182 or 201 VAC	Selectable 144**,163, 182 or 201 VAC
Maximum Input AC Volts (Continuous, Charger at Maximum):	Selectable 259** or 264 VAC	Selectable 259** or 264 VAC
Maximum Input Current (Continuous, Charger at Maximum):	17.0 A	26.0 A (30.0 A***)
Input Frequency:	50 Hz ±10%	50 Hz ±10%
Maximum Output AC (Continuous)	10.4 A	15.7 A
Automatic Transfer Time:	4-6 ms	4-6 ms

**Load sense can reduce this to 1/30 of the listed current. **Factory default setting. ***When AVR is boosting incoming current.†A technician may be able to convert your UPS to receive 60 Hz ±10%power. Consult Tripp Lite for details.*

Diagrams/Esquemas

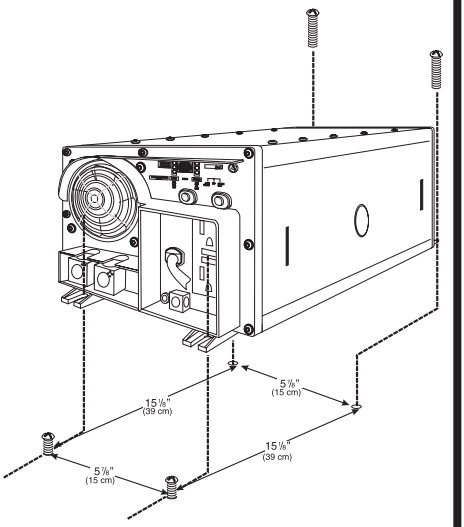
1



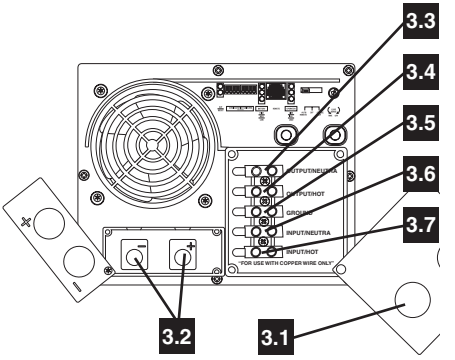
See “Configuration”, pg. 5. 1.1 is DIP Switch Group A. 1.2 is DIP Switch Group B.

Refiérase a la sección “Configuración”, página 22. 1.1 representa el Grupo A de Interruptores DIP. 1.2 representa el Grupo B de Interruptores DIP

2



3

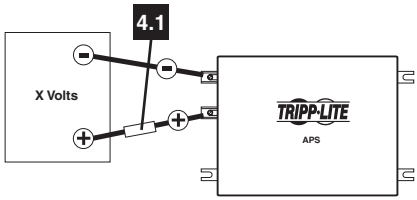


See Hardwire Electrical Connections, pg. 10.
3.1 is the cover plate;
3.2 are the DC input terminals;
3.3 is the output neutral (white);
3.4 is the output hot (black);
3.5 is the input/output ground tie point;
3.6 is the input neutral (blue); and
3.7 is the input hot (brown).

Refiérase a la sección “Conexiones Eléctricas Directas al Circuito”, página 28.
3.1 representa la cubierta;
3.2 representan las terminales de entrada de CD;
3.3 representa la terminal neutra de salida (blanca);
3.4 representa la terminal positiva de salida (negra);
3.5 representa la terminal entrada/salida de tierra;
3.6 representa la terminal neutra de entrada (azul) y
3.7 representa la terminal positiva de entrada (café).

Diagrams/Esquemas

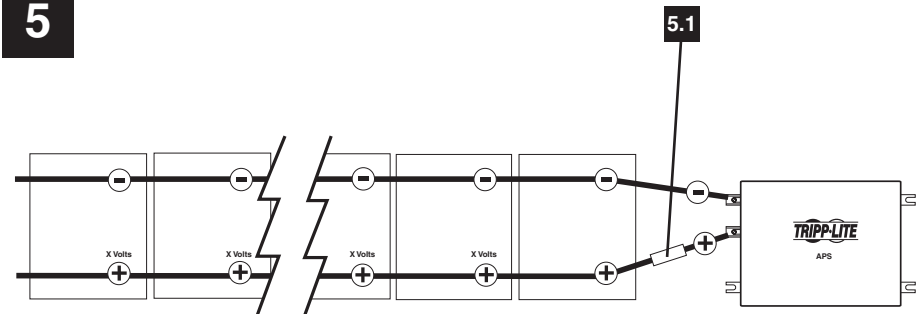
4



See Battery Connection, Pg. 9. 4.1 is the fuse. *X* = Your APS's Inverter's Nominal Input Voltage. (See specs.)

Refiérase a la sección "Conexión de Baterías", página 26. 4.1 representa el fusible. X = El Voltaje Nominal de Entrada del Inversor del APS. (Vea las especificaciones).

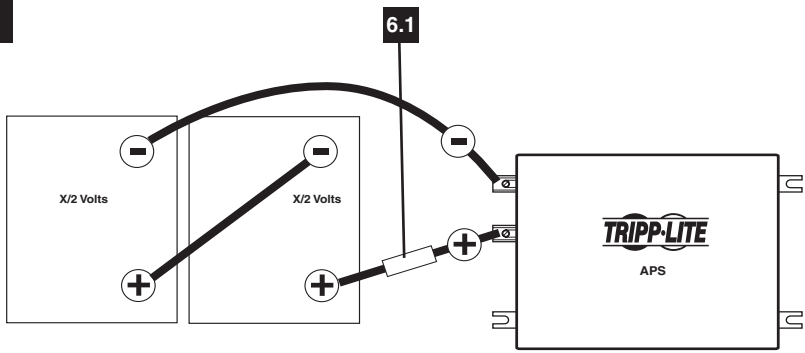
5



See Battery Connection, Pg. 9. 5.1 is the fuse. X = Your APS's Inverter's Nominal Input Voltage. (See specs.)

Refiérase a la sección "Conexión de Baterías", página 26. 5.1 representa el fusible. X = El Voltaje Nominal de Entrada del Inversor del APS. (Vea las especificaciones).

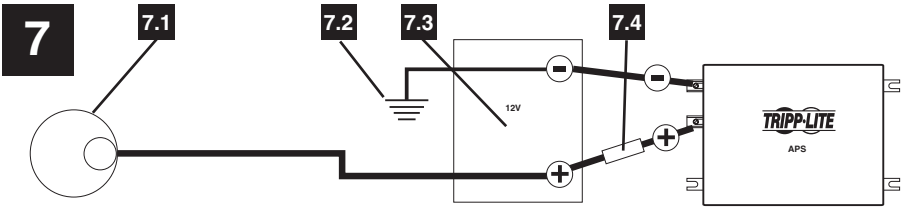
6



See Battery Connection, Pg. 9. 6.1 is the fuse. X = Your APS's Inverter's Nominal Input Voltage. (See specs.)

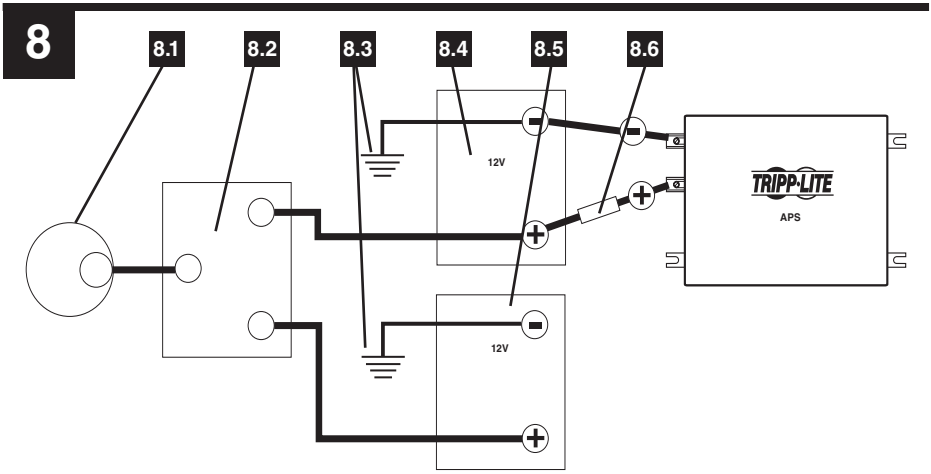
Refiérase a la sección "Conexión de Baterías", página 26. 6.1 representa el fusible. X = El Voltaje Nominal de Entrada del Inversor del APS. (Vea las especificaciones).

Diagrams/Esquemas



Basic 12VDC Vehicular Battery Connection. See Pg. 9.
7.1 is the alternator. 7.2 is the vehicle battery ground. 7.3 is the vehicle battery. 7.4 is the fuse.

Conexión Básica de Baterías de 12V de CD en Vehículos. Vea página 27.
7.1 representa el alternador.
7.2 representa la conexión a tierra de la batería del vehículo.
7.3 representa la batería del vehículo. 7.4 representa el fusible.

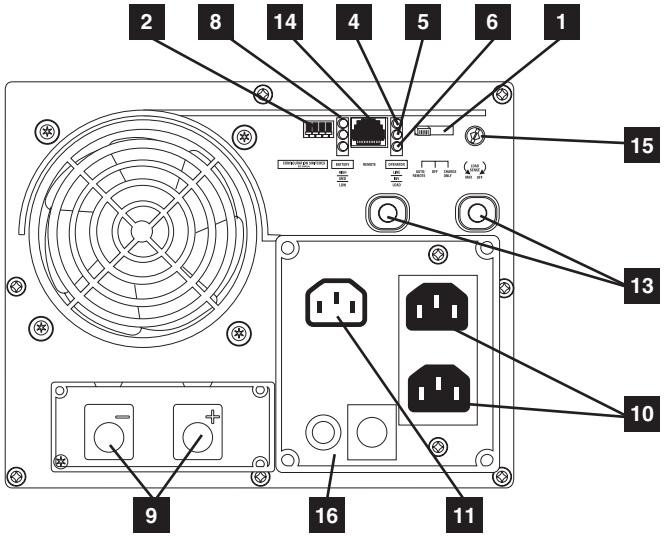


Advanced 12VDC Vehicular Battery Connection. See Pg. 9.
8.1 is the alternator. 8.2 is a battery isolator. 8.3 is the vehicle battery ground. 8.4 is an auxiliary vehicle battery. 8.5 is the vehicle battery. 8.6 is the fuse.

Conexión Avanzada de Baterías de 12V de CD en Vehículos. Vea página 27.
8.1 representa el alternador. 8.2 representa el aislador de la batería. 8.3 representa la conexión a tierra de la batería.
8.4 representa la batería auxiliar del vehículo.
8.5 representa la batería del vehiculo. 8.6 representa el fusible.

Diagrams/Esquemas

9a Corded Model • Modelo con Cable

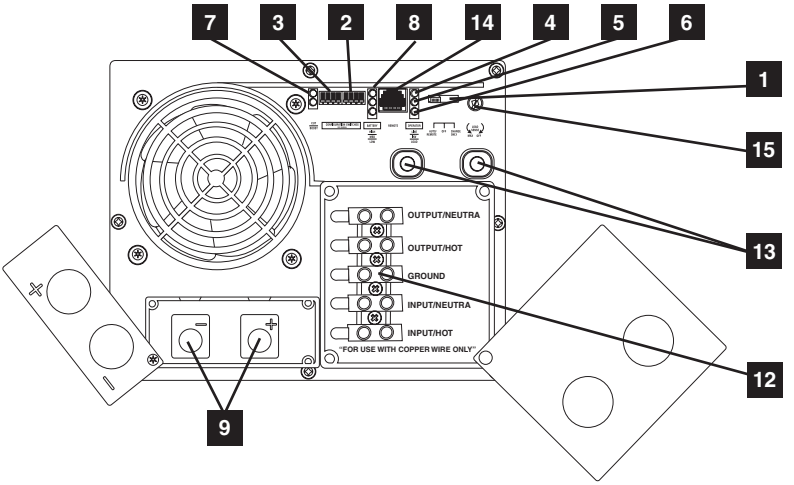


1. Operating Mode Switch (All models)
2. DIP Switch Group A (All models)
3. DIP Switch Group B (Select models only)
4. “LINE” (All models)
5. “INV” (Inverting—all models)
6. “LOAD” (All models)
8. “BATTERY HI/MED/LO” (All models)
9. DC Input Terminals (All models)
10. AC Receptacles (Corded models only)
11. Fixed AC Input Line Cord fixed (Corded models only)
13. Resettable Circuit Breakers (All models)
14. Remote Module Connector (All models)
15. Load Sense Potentiometer (All models)
16. Ground Connector Block (Corded models only)

1. Interruptor “Operating Mode” (Modo de operación)
2. Grupo A de Interruptores DIP (Todos los modelos)
3. Grupo B de Interruptores DIP (Modelos selectos únicamente)
4. “LINE” (Línea) (Todos los modelos)
5. “INV” (Inversor) (Todos los modelos)
6. “LOAD” (Carga Conectada)
8. “BATTERY HI/MED/LO” (Carga de Baterías Alta/Media/Baja) (Todos los modelos)
9. Terminales de Entrada de CD (Todos los modelos)
10. Receptáculos de CA (Solamente en los modelos con cable de CA)
11. Cable de Línea de CA (Solamente en los modelos con cable de CA)
13. Interruptores de Circuito con Restablecimiento
14. Conector para el Módulo de Control Remoto (Todos los modelos)
15. Potenciómetro Sensor de Carga Conectada (Todos los modelos)
16. Conexión a Tierra (Solamente en los modelos con cable de CA)

9b

Hardwired Model • Modelo con Toma Directa al Circuito



1. Operating Mode Switch (All models)
2. DIP Switch Group A (All models)
3. DIP Switch Group B (Select models only)
4. “LINE” (All models)
5. “INV” (Inverting—all models)
6. “LOAD” (All models)
7. “CUT/BOOST” (VR models only)
8. “BATTERY HI/MED/LO” (All models)
9. DC Input Terminals (All models)
12. AC Input/Output Terminal Strip (Hardwire models only)
13. Resettable Circuit Breakers (All models)
14. Remote Module Connector (All models)
15. Load Sense Potentiometer (All models)

1. Interruptor “Operating Mode” (Modo de operación) (Todos los modelos)
2. Grupo A de Interruptores DIP (Todos los modelos)
3. Grupo B de Interruptores DIP (Modelos selectos únicamente)
4. “LINE” (Línea) (Todos los modelos)
5. “INV” (Inversor) (Todos los modelos)
6. “LOAD” (Carga Conectada) (Todos los modelos)
7. “CUT/BOOST” (disminuyendo / elevando) (Modelos VR solamente)
8. “BATTERY HI/MED/LO” (Carga de Baterías Alta/Media/Baja) (Todos los modelos)
9. Terminales de Entrada de CD (Todos los modelos)
12. Barra de Terminales de Toma Directa a Entrada/Salida de CA (Modelos con toma directa al circuito solamente)
13. Interruptores de Circuito con Restablecimiento
14. Conector para el Módulo de Control Remoto (Todos los modelos)
15. Potenciómetro Sensor de Carga Conectada (Todos los modelos)